before the degree is to pit a man against competitors a year older.

As regards "medical chemistry" or "medical physics," it should be stated, clearly and with emphasis, that we want students to be grounded in the fundamental principles of chemistry and physics, and that "medical physics" is an utter delusion. A competent teacher will use such illustrations as will bring his teaching into close relation with the interests and ambitions of his pupils, whether medical, engineering, or other. Only in this sense can we allow any branch of science to be "medicated."

Domestic Training and Science for Girls.

(3) The Incorporated Association of Assistant Mistresses in Public Secondary Schools devoted the afternoon of their twenty-fifth annual meeting to a discussion of the science curriculum for girls. Miss Laurie (Cheltenham Ladies' College) read a paper dealing with the principles to be followed in planning a science course. They wanted to train children in scientific method and management; they should not cram facts, but develop faculties. Much depended upon proper grading of experimental work, and it was important to use simple apparatus. There was a danger of providing technical education without a scientific training. This led to the British workman being beaten by the German.

Miss Wood (Leeds Girls' High School) described a course of "science applied to domestic life" which had been carried out at Leeds. In addition to laboratories for chemistry and physics, the school possessed a "kitchen laboratory." Her object was to make common things and ordinary phenomena the very centre of the teaching, to develop scientific principles, and inculcate the scientific habit in the closest possible connection with the facts of everyday life. The household, and above all the kitchen, abounded in things and problems that could be made the object of simple scientific inquiry; their study stimulated the interest of girls. For a home task Miss Wood had set high-school girls to clean the flues of the kitchen range, light the fire, and arrange to have the water hot. In that sort of way the cooperation of home and school was secured.

During the discussion which followed several speakers feared the danger of making scientific instruction too utilitarian; the domestic training might be acquired at the expense of, and not in addition to, the training in exact thinking.

So great a majority of girls will become better and more efficient women by acquiring domestic knowledge and skill, and the spread of such acquirements is so important to national physique, that there can be little hesitation in encouraging domestic training in our girls' schools—it being obvious that in very many cases the home cannot meet the need; but in actual laboratory work the choice of subject and method must have unity of aim. Which is to be the dominant ideal in the teacher's mind? Some experience of girls' schools, and a careful observation of the plan pursued in some of the most successful technical classes, lead me to suggest that it will be found best to develop a *science* course, using domestic phenomena for illustrations wherever suitable, to be followed in the last year by a course frankly and directly aiming at *domestic* training, parallel with, or in place of, the science course. This would mean that science and domestic training would be correlated, but have separate places in the time-table.

G. F. D.

A PROPOSED NORTH POLAR EXPEDITION.

AT the meeting of the Royal Geographical Society on January 25 Captain Roald Amundsen read a paper explaining his plans for a proposed north polar expedition. Mr. Amundsen urges the necessity for another crossing of the Arctic Ocean, not merely in order to gain further knowledge of the ocean itself, but to study the general problems of oceanography with the greatly improved methods which have come into use since the date of the *Fram* expedition, under the favourable conditions of an ice-covered sea, which gives a fixed undisturbed surface from which to work. He brings forward in his paper many interesting examples of the progress which has been made during the last twelve years in improving the apparatus and methods of deep-sea investigation, and many arguments in support of his contention that the polar ocean offers unequalled opportunities for settling vexed questions connected with the cause of currents, the effects of tidal action, the reciprocal action of plants and animals at various depths, and so on. A thorough examination of Nansen's old ship, the *Fram*, has shown that the vessel is, or can easily be made, as sound as ever, and fit for another voyage similar to that of the famous expedition of 1893–6.

The plan of the expedition is stated as follows:—"With the *Fram* equipped for seven years, and a capable crew, I shall leave Norway in the beginning of 1910. We shall make for San Francisco round Cape Horn, taking in coal and provisions at the former place. We shall then shape our course for Point Barrow, the most northerly point of North America, which I hope to reach by July or August. From this place the last news will be sent home before the real voyage begins. On leaving Point Barrow it is my intention to continue the voyage with as small a crew as possible. We shall then make for the drift-ice in a direction north by north-west, where we will then look for the most favourable place for pushing farther north. When this has been found we shall go as far in as possible, and prepare for a four or five years' drift across the Polar sea. Throughout our voyage up to this point, I intend to make oceanographic observations; and from the moment the vessel becomes fast in the ice, a series of observations will be begun, with which I hope to solve some of the hitherto unsolved mysteries. What I expect to find in the unknown part of the Polar sea I will say nothing about at present. Some people have put forward theories of great masses of land, others of small. I ought perhaps also to have put forward my theory, but think it wiser to refrain from doing so until I have investigated matters at closer quarters."

THE GEOLOGICAL SOCIETY OF GLASGOW

THE jubilee of the Geological Society of Glasgow was celebrated on January 28, when a conversazione was held in the University of Glasgow. An address was delivered by Sir Archibald Geikie, K.C.B., president of the Royal Society, and now the senior member of the Glasgow society. Prof. J. W. Gregory, F.R.S., the president, said the Geological Society of Glasgow has been fortunate in its roll of distinguished members. For twenty-two years the late Lord Kelvin was its president. The name which has been longest on the list of members is that of Sir Archibald Geikie. In 1862 he read to the society a paper which occupied three-fourths of the first volume of the Transactions, and at once lifted British glacial geology on to a new plane.

Sir Archibald Geikie, during the course of his address, said it was not until some fifty years ago that the number of men following a geological bent grew large enough in Glasgow to call for the formation of a geological society. It is a curious fact, he said later, that some of the earlier writers on Scottish geology were foreigners, some of them having been attracted to this country by the fame of the wonders of Staffa and the Western Isles. One of the earliest and most celebrated of these visitors was the Frenchman Faujas de Saint-Fond, who in the year 1784 travelled from the south of France to see the marvels of Fingal's Cave. On his way back from the West Highlands Faujas de Saint-Fond passed through Edinburgh, and met there the illustrious James Hutton, who, he tells us, "was at that time engaged, in the calm of his study, writing a work on the theory of the earth." Little could the French traveller have divined that "this modest philosopher," as he called him, would in after years be universally acclaimed as one of the great founders of modern geology. In the year 1819 there appeared the monumental "Description of the Western Islands of Scotland," by John Macculloch, in

which was given an excellent account of the Clyde islands. Contemporary with Macculloch was another observer to whom Scottish geology stands deeply indebted, Ami Boué. After taking his degree in Scotland Boué went to Paris, where for a time he employed himself in preparing his "Essai géologique sur l'Écosse," which saw the light in the year 1820. A few native inquirers began to make their appearance during the closing years of the eighteenth and the early decades of the nineteenth century as pioneers in the investigation of the details of the local geology. First came David Ure, whose excellent "History of Rutherglen and East Kilbride," published in 1783, stands out pre-eminent for the fulness and faithfulness of its descriptions. Afterwards came Andrew C. Ramsay. After referring to the work of John Craig in Lanarkshire, Montgomery in Renfrewshire, Prof. Thomas Thomson in Glasgow University, and James Bryce, Sir Archibald Geikie said that of all the influences which conspired to raise in Glasgow an interest in the geological history of the district he was disposed to give the foremost place to that of James Smith, of Jordanhill.

THE WINNIPEG MEETING OF THE BRITISH ASSOCIATION.

A CIRCULAR has been prepared containing information of interest to members of the British Association who propose to attend the meeting to be held in Winnipeg, Manitoba, Canada, in August next, under the presidency of Sir J. J. Thomson, F.R.S. A representative local executive committee and officers have been appointed to conduct the local arrangements, which will include some interesting excursions and facilities for a tour through the Western Provinces to the Pacific Coast. The weather conditions during the latter part of August and the beginning of September are favourable in the Western Provinces of Canada, whilst in Winnipeg, situated 760 feet above sea-level, the days are warm, though not oppressively hot, and the nights are invariably cool. On account of August being the busiest month of the year in bookings to America, no reduction on minimum steamship rates will be made to members of the association, but superior accommodation may be granted, on the return voyage, at the ordinary minimum rate. The journey to Winnipeg, the meeting, and return home will take about thirty-two days. There will be a western excursion from Winnipeg to Regina, Moose Jaw, Calgary, Edmonton, Vancouver, and Victoria, and return to Winnipeg; members who take part in this excursion will require ten more days, thus making a six weeks' visit. Special fares are expected to be in force on the Canadian railways, amounting probably to a single fare for the return journey, from Montreal to Winnipeg, provided the party numbers not less than fifty; as also from Winnipeg to Vancouver, or for any side-trip made by individual members. The estimated personal expenditure of each member attending the meeting from Great Britain is a minimum of about 38*l*., and an average of about 65*l*. The additional expense of the western excursion will be about 25*l*. Any member of the association who contemplates an extensive journey of exploration or for other scientific purposes, fishing, hunting, &c., is invited to communicate with the local secretaries of the British Association, University of Manitoba, Winnipeg. Expert advice and assistance will be given to any group of members who propose to avail themselves of this opportunity. A list of hotels and lodgings will be issued by the Winnipeg executive officers, to whom application should be made, early in July.

Members who propose to attend the meeting should send in their names to Mr. H. C. Stewardson, assistant treasurer of the British Association, Burlington House, London, W., not later than May 31, by which date members should, if possible, complete their arrangements with the steamship companies, as all the best accommodation on steamers sailing in August is booked some months ahead. An illustrated handbook of preliminary information, issued by the Winnipeg executive committee, will be forwarded from the office of the association on receipt of 2½*d*. for postage.

MECHANICAL FLIGHT.[1]

Present Position.

THE recent records made by Messrs. Wright, Farman, Delagrange, and Bleriot, together with the gradual accumulation of testimony in favour of mechanical flight, have finally disabused both the public and experts of the notion that aviation is a dream.

Many engineers from time immemorial have tackled the subject without success, and there was every reason for the sceptical attitude which has prevailed until the last few years. It is now evident that mechanical flight was impossible before science and engineering skill in the nineteenth century had so perfected the heat engine that considerable power was obtainable with but little weight. The present improved aspect of affairs must not, however, blind us to the fact that much has yet to be done. The most successful machines now in existence show serious defects, cannot be manipulated in troublesome weather, and have every part so light that at all times they are on the brink of collapse. It rests with mechanical engineers to design a stronger machine without losing efficiency. In the course of this paper the author proposes to indicate certain points in which improvement is desired, and at the same time he has endeavoured to include a sufficiency of the theoretical and experimental knowledge available on the subject to enable a would-be aviator to construct a simple type of machine.

It cannot be too strongly realised that existing information is defective, and a few words as to research may be useful.

Necessity for Research.

It will be shown in the course of this paper that the whole question of mechanical flight depends upon a knowledge of the manner in which air reacts against solid bodies moving through it. A large number of researches have been made during the past 150 years, but even yet exact information is lacking on the majority of points.

Furthermore, mathematical analysis has not been sufficiently developed. A few great mathematicians (including Lords Kelvin and Rayleigh) have devoted some attention to the matter, but the author is not aware that any mathematician worthy of the name has considered it worth while to make an exhaustive study of the question, although it must be recognised that the recent advances in the theory of hydrodynamics form useful auxiliaries to the study of aërodynamics.

Brief History of the Theory.

The nature of fluid resistance has been investigated for many years, and the general principles are to be found in Newton's "Principia." The ballistic researches of Hutton and Robins at the end of the eighteenth century first clearly showed the quantitative value of air resistance, and their work is still valuable. On the hypothesis deducible from Newton's work, Messrs. Navier and Gay-Lussac early in the nineteenth century formulated a theory of flight which showed that great power was necessary, and this notion held sway for many years after, so that little progress was made with the subject, flight being deemed impracticable. Experiments by Wenham and Browning in the 'eighties, together with Langley's researches in America and Maxim's in England, clearly showed the fallacy of this idea. Pénaud in 1876 first gave the mathematical theory of the aëroplane, which had been conceived by Henson in 1840. The late Mr. Froude, Lord Rayleigh, and Prof. Bryan developed this theory, and in 1903 the last-named produced equations of stability for the aëroplane. Two years later Captain Ferber, of the French artillery, amplified these equations to find the conditions of lateral stability and the form of the trajectory, and quite recently Mr. Lanchester has done similar work. Prof. Fitzgerald and Lord Rayleigh have given some attention to the ornithoptère, and Profs. Pettigrew and Marey at an earlier date arrived at several important conclusions respecting bird flight. The helicoptère has not received very much attention, but the cognate work of the late Mr. Froude and his son on propellers has a most important

[1] Abridged from a paper by Mr. Herbert Chatley read before the Society of Engineers on December 7, 1908.